



**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 39**

**[Docket No. FAA-2021-0874; Project Identifier AD-2021-00668-E]**

**RIN 2120-AA64**

**Airworthiness Directives; Rolls-Royce Corporation (Type Certificate previously held by Allison Engine Company) Turboprop Engines**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Notice of proposed rulemaking (NPRM).

**SUMMARY:** The FAA proposes to adopt a new airworthiness directive (AD) for certain Rolls-Royce Corporation (RRC) AE 2100D3 model turboprop engines. This proposed AD was prompted by an in-flight shutdown (IFSD) of an engine and subsequent investigation by the manufacturer that revealed a crack in the 3rd-stage compressor wheel. This proposed AD would require replacement of the affected 3rd-stage compressor wheel. The FAA is proposing this AD to address the unsafe condition on these products.

**DATES:** The FAA must receive comments on this proposed AD by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** You may send comments, using the procedures found in 14 CFR 11.43 and 11.45, by any of the following methods:

- Federal eRulemaking Portal: Go to <https://www.regulations.gov>. Follow the instructions for submitting comments.
- Fax: (202) 493-2251.
- Mail: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.
- Hand Delivery: Deliver to Mail address above between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

For service information identified in this NPRM, contact Rolls-Royce Corporation, 450 South Meridian Street, Mail Code NB-01-06, Indianapolis, IN, 46225; phone: (317) 230-1667; email: CMSEindyOSD@rolls-royce.com; website: www.rolls-royce.com. You may view this service information at the FAA, Airworthiness Products Section, Operational Safety Branch, 1200 District Avenue, Burlington, MA 01803. For information on the availability of this material at the FAA, call (781) 238-7759.

### **Examining the AD Docket**

You may examine the AD docket at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2021-0874; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this NPRM, any comments received, and other information. The street address for Docket Operations is listed above.

**FOR FURTHER INFORMATION CONTACT:** Kyri Zaroyiannis, Aviation Safety Engineer, Chicago ACO, FAA, 2300 E. Devon Avenue, Des Plaines, IL 60018; phone: (847) 294-7836; fax: (847) 294-7834; email: kyri.zaroyiannis@faa.gov.

### **SUPPLEMENTARY INFORMATION:**

#### **Comments Invited**

The FAA invites you to send any written relevant data, views, or arguments about this proposal. Send your comments to an address listed under ADDRESSES. Include “Docket No. FAA-2021-0874; Project Identifier AD-2021-00668-E” at the beginning of your comments. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. The FAA will consider all comments received by the closing date and may amend this proposal because of those comments.

Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, the FAA will post all comments received, without change, to <https://www.regulations.gov>, including any personal information you provide. The agency will also post a report summarizing each substantive verbal contact received about this NPRM.

## **Confidential Business Information**

CBI is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this NPRM contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this NPRM, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as “PROPIN.” The FAA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this NPRM. Submissions containing CBI should be sent to Kyri Zaroyiannis, Aviation Safety Engineer, Chicago ACO, FAA, 2300 E. Devon Avenue, Des Plaines, IL 60018. Any commentary that the FAA receives which is not specifically designated as CBI will be placed in the public docket for this rulemaking.

## **Background**

The FAA was notified of an uncommanded IFSD of a RRC AE 3007A1 model turbofan engine installed on an Embraer S.A. model EMB-145 airplane (marketed as ERJ-145), while conducting a revenue flight. The manufacturer’s investigation of this incident revealed that the IFSD resulted from a low-cycle fatigue crack in the dovetail slot for the blade attachment in the 3rd-stage compressor wheel, causing one 3rd-stage compressor blade to release. The crack initiated in the dovetail slot due to a sharp corner in the wheel slot geometry. The broaching process was identified as the cause of the crack and parts from this manufacturing lot required removal from service.

In response to this event and the manufacturer’s subsequent investigation, the FAA issued a final rule; request for comments, AD 2020-16-13 (85 FR 45769, July 30, 2020), requiring replacement of certain 3rd-stage compressor wheels installed on RRC AE 3007A, AE 3007A1, AE 3007A1/1, AE 3007A1/2, AE 3007A1/3, AE 3007A1E, AE 3007A1P, and AE 3007A3 model turbofan engines before the 3rd-stage compressor wheels accumulate a specified number of cycles. The actions required by AD 2020-16-13 address engines that experienced high stresses at the 3rd stage compressor wheel location and accumulated cycles at a high rate. The FAA now proposes to require removal of

certain AE 2100D3 3rd-stage compressor wheels that were produced in the same lot as the AE 3007 3rd-stage compressor wheels identified in AE 2020-16-13, before they accumulate a specified number of cycles. This condition, if not addressed, could result in uncontained release of the 3rd-stage compressor wheel, damage to the engine, and damage to the airplane.

#### **FAA’s Determination**

The FAA is issuing this NPRM after determining that the unsafe condition described previously is likely to exist or develop on other products of the same type design.

#### **Related Service Information**

The FAA reviewed Rolls-Royce Alert Service Bulletin (ASB) AE 2100D3-A-72-330, Engine – 3rd Stage Compressor Wheel Removal for Reduced Life Limit, dated June 11, 2021. The ASB specifies procedures for removal of a certain 3rd-stage compressor wheel.

#### **Proposed AD Requirements in this NPRM**

This proposed AD would require replacement of a certain 3rd-stage compressor wheel before it accumulates a specified number of cycles.

#### **Costs of Compliance**

The FAA estimates that this AD, if adopted as proposed, would affect 15 engines installed on airplanes of U.S. registry.

The FAA estimates the following costs to comply with this proposed AD:

##### **Estimated costs**

<b>Action</b>	<b>Labor Cost</b>	<b>Parts Cost</b>	<b>Cost per product</b>	<b>Cost on U.S. operators</b>
Remove and replace 3rd-stage compressor wheel	125 work-hours x \$85 per hour = \$10,625	\$32,844	\$43,469	\$652,035

#### **Authority for this Rulemaking**

Title 49 of the United States Code specifies the FAA’s authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator.

Subtitle VII: Aviation Programs, describes in more detail the scope of the Agency's authority.

The FAA is issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: General requirements. Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

### **Regulatory Findings**

The FAA determined that this proposed AD would not have federalism implications under Executive Order 13132. This proposed AD would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify this proposed regulation:

- (1) Is not a "significant regulatory action" under Executive Order 12866,
- (2) Would not affect intrastate aviation in Alaska, and
- (3) Would not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

### **List of Subjects in 14 CFR Part 39**

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

### **The Proposed Amendment**

Accordingly, under the authority delegated to me by the Administrator, the FAA proposes to amend 14 CFR part 39 as follows:

### **PART 39 - AIRWORTHINESS DIRECTIVES**

- 1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

### **§ 39.13 [Amended]**

- 2. The FAA amends § 39.13 by adding the following new airworthiness directive:

**Rolls-Royce Corporation (Type Certificate previously held by Allison Engine Company):** Docket No. FAA-2021-0874; Project Identifier AD-2021-00668-E.

**(a) Comments Due Date**

The FAA must receive comments on this airworthiness directive (AD) by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**(b) Affected ADs**

None.

**(c) Applicability**

This AD applies to Rolls-Royce Corporation (RRC) AE 2100D3 model turboprop engines with a 3rd-stage compressor wheel, part number (P/N) 23084158, and with a serial number listed in Figure 1 to paragraph (c) of this AD.

**Figure 1 to Paragraph (c) – Serial Numbers of Affected P/N 23084158 3rd-stage Compressor Wheels**

L343502	L343539	L343545	L343546
L343547	L343550	L343553	L343554
L343555	L343566	L343569	L343573
L343576	L343578	L343579	L343580
L343584	L343588	L343593	L343594
L343597	L343602		

**(d) Subject**

Joint Aircraft System Component (JASC) Code 7230, Turbine Engine Compressor Section.

**(e) Unsafe Condition**

This AD was prompted by an in-flight shutdown of an engine during a revenue flight and subsequent investigation by the manufacturer that revealed a crack in the 3rd-stage compressor wheel. The FAA is issuing this AD to prevent failure of the 3rd-stage compressor wheel. The unsafe condition, if not addressed, could result in an uncontained

release of the 3rd-stage compressor wheel, damage to the engine, and damage to the airplane.

**(f) Compliance**

Comply with this AD within the compliance times specified, unless already done.

**(g) Required Actions**

Before the affected 3rd-stage compressor wheel exceeds 5,200 flight cycles since new, remove the affected 3rd-stage compressor wheel and replace with a part eligible for installation.

**(h) Definition**

For the purpose of this AD, a part eligible for installation is a 3rd-stage compressor wheel that does not have a P/N and a serial number listed in the Applicability, paragraph (c) of this AD.

**(i) Special Flight Permit**

A special flight permit may be issued in accordance with 14 CFR 21.197 and 21.199 to permit a one-time, non-revenue ferry flight to a location where the engine can be removed from service. This ferry flight must be performed with only essential flight crew.

**(j) Alternative Methods of Compliance (AMOCs)**

(1) The Manager, Chicago ACO, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or local Flight Standards District Office, as appropriate. If sending information directly to the manager of the certification office, send it to the attention of the person identified in paragraph (k) of this AD.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the local flight standards district office/certificate holding district office.

**(k) Related Information**

For more information about this AD, contact Kyri Zaroyiannis, Aviation Safety Engineer, Chicago ACO, FAA, 2300 E. Devon Avenue, Des Plaines, IL 60018; phone: (847) 294-7836; fax: (847) 294-7834; email: [kyri.zaroyiannis@faa.gov](mailto:kyri.zaroyiannis@faa.gov).

Issued on October 5, 2021.

Gaetano A. Sciortino, Deputy Director for Strategic Initiatives,  
Compliance & Airworthiness Division,  
Aircraft Certification Service.  
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